

**The Infant Feeding Practices of Human
Immunodeficiency Virus positive women within the
Prevention of Mother To Child Transmission program
in Soweto, Johannesburg**

Donna Jacobs Jokhan

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Declaration

I, Donna Jacobs Jokhan declare that this research report is my own work. It is being submitted for the degree of Master of Public Health at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this University.

Signed

This 15th day of April, 2011

Dedication

I dedicate this research report to my family and friends, for their unflagging dedication, love and support.

Abstract

Introduction: In South Africa, over 25% of all babies born each year are exposed to HIV. The high antenatal HIV sero-prevalence rates coupled with high levels of maternal morbidity and mortality advocate for high quality maternal and child health care, which should include resilient PMTCT programs. This study aimed to explore infant feeding practices selected by HIV-positive women enrolled on a PMTCT program and describe some of the reasons for their choices, within the first 6 months postpartum. The study also reports on infant feeding practice and HIV status of the infant.

Methodology: The study was a cross-sectional study which was carried out within the Perinatal Research Unit at Chris Hani Baragwanath hospital in Soweto. A sample of 200 women enrolled in the PMTCT program was interviewed, using a semi-structured questionnaire, during April 2007 – June 2007.

Results: The study revealed that 84.5% of the study population had received infant feeding counseling. There was a high rate of exclusive formula feeding (EFF=84.5%), with lower exclusive breastfeeding (EBF=14%) and mixed feeding (MF=1.5%) rates. The corresponding HIV transmission rates were EFF – 26% (n=44/169); EBF – 75% (n=21/28); MF – 100% (n=3/3). The study demonstrated that babies born to mothers who did not receive information on infant feeding were twice as likely to be HIV positive (OR=2.43), which was statistically significant. The study also showed that the timing of the counseling was critical – all mothers who received counseling 6 weeks or more after delivery had HIV-positive babies. The overwhelming majority of women (78%) indicated that they would breast feed their babies if they were HIV-negative.

Conclusion: The study demonstrated the vital role of infant feeding counseling in antenatal care and PMTCT programs. It illustrated that it was critically important that all HIV-infected women receive infant feeding counseling as soon as possible after the HIV diagnosis is made, prior to delivery and highlighted the importance of reinforcement of infant feeding choice at every antenatal care visit, for every woman.

The key recommendations focus on the need for:

- Improved Antenatal care for all pregnant women
- Improved care for HIV-positive pregnant women
- Improvements in infant feeding counseling for HIV positive women
- Integration of Maternal, Child health and PMTCT programs
- Intensification of ongoing prevention efforts
- The need for further research to:
 - identify some of the reasons HIV positive women choose certain infant feeding modalities throughout the country, and the challenges associated with these; and
 - critically evaluate the training that health care workers and counselors receive, regarding infant feeding counseling

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Nomenclature

AFASS	Affordable, feasible, acceptable, sustainable and safe
AIDS	Acquired immunodeficiency syndrome
ARV	Anti-retroviral (medicine)
ART	Anti retroviral Therapy
AZT	Zidovudine (Anti-retroviral medication)
BANC	Basic Antenatal Care Package
CD4 count	Count of Helper T cells
CHC	Community Health Centre
CI	confidence interval
C/S	Caesarean section
FTC	Emtricitabine (Anti-retroviral medication)
HAART	Highly Active Anti-retroviral Treatment
HAST	HIV/AIDS, Sexually transmitted infections and TB
HR	hazard ratio
HIV	Human immunodeficiency virus
HSRC	Human Sciences Research Council
MOU	Maternity Obstetrics unit
MRC	Medical Research Council
MTCT	Mother to Child Transmission (of HIV)
n	Number of patients
NVD	normal vaginal delivery
NVP	Nevirapine
OR	Odds Ratio
PCR test	Polymerase chain reaction test
PHRU	Perinatal HIV Research Unit
PHC	Primary Health Care Clinic
PMTCT	Prevention of Mother to Child Transmission (of HIV)
RVD	Retroviral disease (HIV)

sdNVP	single dose of Nevirapine (Anti-retroviral medication)
STATA	general-purpose statistical software package
TB	Tuberculosis
TDF	Tenofovir (Anti-retroviral medication)
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNICEF	The United Nations Children's Fund
CT	Counseling and Testing (for HIV)
WHO	World Health Organization

CHAPTER 1: INTRODUCTION

1.1 Background

1.1.1 Epidemiology of HIV in South Africa

Globally, the number of people infected with the Human Immunodeficiency Virus (HIV) has assumed epidemic proportions. According to the 2008 UNAIDS report, there were between 30 and 33 million people living with HIV and AIDS at the end of 2007¹. Of these, the highest prevalence rates (20.5 – 23.6 %) were in Sub-Saharan Africa, with an estimated 22 million individuals living with HIV and AIDS in this region, among whom an estimated 60% were females 15 years or older. In the absence of intervention, these statistics translate to a maternal to child HIV transmission rate of 15 – 28% annually and consequently high rates of morbidity and mortality in children under 5 years¹.

Within South Africa 5.2 million people are estimated to be living with HIV and AIDS². This is approximately 10.6% of the total population of 47 million. For adults aged 15 – 49 years, an estimated 17% of the population is HIV positive². Between 2001 and 2006, national sero-prevalence surveys among pregnant women showed that HIV prevalence increased from 24.8% in 2001 to a peak of 30.2% in 2005 and thereafter decreased to 29.1% in 2006³. At the end of 2007, the HIV prevalence in women attending antenatal clinics was estimated to be 29.4%, with the highest prevalence in women 25-29 years and 30-34 years⁴. In 2008 the HIV prevalence in women attending antenatal clinics was estimated to be 29.3%. This means that over one quarter of all babies born in the country is exposed to HIV in utero, during labour and delivery (and during breastfeeding). In addition, the large number of babies born to women who do not attend ante-natal clinics,

or seroconvert during their pregnancies or who are not tested for HIV while in antenatal care may add to the overall rates.

Work published by the HSRC in 2007 included analysis of the 2005 South African National Household Survey to generate national HIV incidence estimates stratified by age, sex, race, province and locality type, to compare the HIV incidence and HIV prevalence profiles by sex, and to examine the relationship between HIV prevalence, HIV incidence and associated risk factors. The results indicated that of 571,000 new HIV infections in 2005, 34% occurred in young people aged 15 – 24 years. HIV incidence in females 20 – 29 years was 5.6% - more than 6 times more than in males (0.9%) of the same age. Among youth aged 15 – 24 years, females accounted for 90% of new infections. These findings suggested that current prevention campaigns were not having the desired impact, particularly among young women, as incidence of HIV was on the incline⁵, despite national antenatal sero-prevalence results to the contrary.

According to the 2008 UNAIDS report, between 230,000 and 320,000 children were living with HIV in South Africa at the end of 2007¹. Earlier literature, such as the Initial Burden of Disease Estimates for South Africa, 2000, done by the MRC, estimated mortality in children below 5 years due to HIV and AIDS at 30%⁶. In 2007, UNICEF data estimated mortality in children below 5 years due to HIV and AIDS at 74 per 1000 live births⁷ in Sub-Saharan Africa. Further anecdotal experience describes HIV disease accounting for at least 65% of all pediatric admissions in South Africa.

These findings are echoed in the recently released Saving Mothers (2005 – 2007): Fourth Report on Confidential Enquiries into Maternal Death in South Africa⁸, which describe the main causes of maternal mortality over the 2005 – 2007 triennium. The report indicates that the incidence of maternal deaths has increased by 20.1% from the previous triennial period (2002 – 2004), with 4077 maternal deaths being reported. The five main causes of maternal mortality described are non-pregnancy infections (43.7%), complications of hypertension (15.7%), obstetric hemorrhage (12.4%), pregnancy-related sepsis (9.0%) and pre-existing maternal disease (6.0%). Important to note is the fact that 46.2% of all maternal deaths were in HIV positive women. The Saving Babies (2008): National Perinatal Morbidity and Mortality Committee Report also highlights the fact that at least 5% of all perinatal deaths are caused by maternal infection, a large proportion of which can be attributable to HIV. While the report does not contain specific data about the morbidity or mortality rates of HIV exposed babies, it reveals that 24% of perinatal deaths were due to unexplained still births and 23% due to spontaneous preterm labour, in addition to the 5% due to maternal infection⁹.

Before April 2004, the South African government's strategic plan for HIV and the Acquired Immunodeficiency Syndrome (AIDS)¹⁰ included objectives such as increasing counseling and testing (CT), improving treatment for people living with HIV / AIDS and provision of opportunistic infection prophylaxis to HIV-exposed infants until a definitive diagnosis was made. Emphasis on peri-natal care and PMTCT prophylaxis for pregnant women and their babies was a major feature of the government's strategic plan and

included nationwide rollout of Prevention of Mother-to-child transmission (PMTCT) programs.

Gauteng, along with the Western Cape, was among one of the first provinces to support the proposed PMTCT programme¹¹, with the roll out of the PMTCT programme commencing initially in Soweto in Johannesburg in September 2001.

Soweto, the name given to a conglomeration of townships is located in the southern and western parts of Johannesburg. With a population of over 4.2 million people¹² and an unemployment rate averaging 66%, poverty, overcrowding and crime are rife. A cross-sectional household survey done by the Perinatal HIV Research Unit (PHRU) in 2002 involving 4,912 households to examine the effects of ill health and adult mortality on the welfare of children in Soweto revealed that 48% of all children lived in a household with 1 sick adult and 11% of children had at least one deceased parent.

A survey undertaken in Soweto in the late 1990's revealed that the highest levels of unemployment were in Sowetans between 20 – 29 years of age, with women being more likely to be unemployed than men¹². With greater numbers of women being unemployed in Soweto, anecdotal evidence suggests that they are at high risk of sexual abuse and high risk relationships, with concurrent sexual partnerships occurring commonly. Transactional sexual relationships and intergenerational sexual relationships also occur commonly. In 2007 the antenatal HIV prevalence in Soweto was reported at 30%,

contributing largely to the Gauteng provincial average of 33%. Health care in the area is provided at Chris Hani Baragwanath hospital, a 2,964 bed tertiary level hospital and 60 local primary health care clinics.

The Perinatal HIV Research Unit (PHRU) in collaboration with the Gauteng Department of Health has been instrumental in setting up and developing significant organizational capability at Chris Hani Baragwanath hospital and the various clinics within Soweto since the PMTCT program has been in place.

As part of the PMTCT program, women attending antenatal clinics receive CT from trained counselors and health personnel, are provided with ART prophylaxis and receive regular advice about ways in which to reduce the risk of transmitting the HIV virus to their babies ¹⁰. One of the most important issues in this context is an emphasis on maternal choice of safe infant feeding practices most appropriate to their circumstances, in line with internationally recommended guidelines ^{13,14,15}. According to the South African National PMTCT guidelines²⁵ the choice of infant feeding is the prerogative of the mother. HIV-positive women are informed of the benefits and risks of the various feeding options, i.e. exclusive breastfeeding, exclusive formula feeding and mixed feeding, at least twice during antenatal care visits. They are assured of unconditional support for their choice of feeding option. The PMTCT protocol makes provision for the supply of free-of-charge formula milk, which is provided from birth until 6 months of

age, if a woman decides to exclusively formula-feed. If however, a woman decides to exclusively breastfeed, she is encouraged to do so for 6 months, introduce complementary foods thereafter and continue breastfeeding for the first 12 months of life. The option of mixed feeding is associated with increased infant morbidity and mortality as well as the highest risk of mother-to-child transmission of HIV, as described in several studies in Table 1 below^{16,17,18,19,20,21,22}.

Table 1: Summary of descriptive studies

Author / Publication Date	Topic	Results
1. Mbori-Ngacha D et al. 2001 ¹⁶	Morbidity and mortality in breastfed and formula-fed infants of HIV-1 infected women: A randomized clinical trial.	<ul style="list-style-type: none"> • Two-year estimated mortality rates among infants were similar in the formula-feeding and breastfeeding arms (20.0% vs 24.4%; hazard ratio [HR], 0.8; 95% confidence interval [CI], 0.5-1.3), even after adjusting for HIV-1 infection status (HR, 1.1; 95% CI, 0.7-1.7). • Infection with HIV-1 was associated with a 9.0-fold increased mortality risk (95% CI, 5.3-15.3). • Incidence of diarrhea (over 2 years) similar in formula and breastfeeding arms (155 vs 149 per 100 person-years) • Incidence of pneumonia identical in the 2 groups (62 per 100 person-years) • No significant differences in incidence of other illnesses • Infants in the breastfeeding arm tended to have better nutritional status, especially during the first 6 months of life • Similar mortality rates and incidence of diarrhea and pneumonia during the first 2 years of life in infants assigned to be formula fed or breastfed • HIV-1-free survival at 2 years higher in formula arm.
2. Newell ML Ghent IAS working group on HIV infection in women and children. 2004 ¹⁷	Mortality among infected and uninfected infants born to HIV-infected women in Africa: infants, HIV, and mortality in Africa study.	<ul style="list-style-type: none"> • 378 (11%) of 3468 children died. • The authors estimate that by 1 year of age 35.2% infected and 4.9% uninfected children will have died; by 2 years of age, 52.5% and 7.6% will have died, without intervention • Mortality varied by geographical region, and was associated with maternal death (adjusted odds ratio 2.27, 95% CI 1.62-3.19), CD4+ cell counts <200 per microL (1.91, 1.39-2.62), and infant HIV infection (8.16, 6.43-10.33). • Mortality was not associated with either 'ever breastfeeding' and 'never breastfeeding' in either HIV-infected or HIV-uninfected children. • In infected children, mortality was significantly lower for those with late infection than those with early infection (0.52, 0.39-0.70). This effect was also seen in analyses of survival from the age at infection (0.74, 0.55-0.99). • The findings highlight the necessity for timely antiretroviral care, for support for HIV-infected women and children in developing countries, and for

		assessment of prophylactic programs to prevent MTCT, including child mortality and infections averted.
3. Dunn D, Newell M, Ades A, Peckham C. 1992 ¹⁸	Risk of human immunodeficiency virus type 1 transmission through breast-feeding.	<ul style="list-style-type: none"> • Systematic review of published studies meeting criteria that allowed determination of quantitative risk of transmission via breastfeeding. • Based on four studies in which mothers acquired HIV post natally, the estimated risk of transmission was 29% (95% CI 16-42%). • Analysis of five studies showed that when the mother was infected prenatally, the additional risk of transmission through breastfeeding, over and above transmission in utero or during delivery, is 14% (95% CI 7-22%). • Authors advise where there are safe alternatives to breastfeeding, universal HIV testing of pregnant women and infant feeding counseling to all HIV positive women.
4. Sherman GG, Jones SA, Coovadia AH, Urban MF, Bolton KD. 2004 ¹⁹	PMTCT from research to reality--results from a routine service.	<ul style="list-style-type: none"> • Study based on 8,221 routine deliveries, of which 1,234 (15%) occurred in women known to be HIV infected. • HIV transmission rates of 8.7% at 6 weeks and 8.9% at 3 months of age in the study population demonstrated the high rate of NVP administration and the ability of women to formula-feed their babies and abstain from breast-feeding. • Study demonstrated an extremely efficacious routine PMTCT program with good record keeping.
5. Nduati R, John G, Mbori-Ngacha D, Richardson B, Overbaugh J, Mwatha A, Ndinya-Achola J, Bwayo J, Onyango F, Hughes J, Kreiss J. 2001 ²⁰	Effect of breastfeeding and formula feeding on transmission of HIV-1.	<ul style="list-style-type: none"> • Compliance with assigned feeding modality - 96% in breastfeeding arm and 70% in formula arm (P<.001) • 401 infants included in the analysis - 94% were followed up to HIV-1 infection or mortality end points: 83% for the HIV-1 infection end point and 93% to the mortality end point. • Cumulative probability of HIV-1 infection at 24 months was 36.7% (95% confidence interval [CI], 29.4%-44.0%) in the breastfeeding arm and 20.5% (95% CI, 14.0%-27.0%) in the formula arm (P = .001). • Estimated rate of breast milk transmission was 16.2% (95% CI, 6.5%-25.9%). Forty-four percent of HIV-1 infection in the breastfeeding arm was attributable to breast milk. Most breast milk transmission occurred early during breastfeeding

		<ul style="list-style-type: none"> • Similar 2-year mortality rates in both arms ($P = 0.30$). (breastfeeding arm, 24.4% [95% CI, 18.2%-30.7%] vs formula feeding arm, 20.0% [95% CI, 14.4%-25.6%]; • Use of breast milk substitutes prevented 44% of infant infections; associated with significantly improved HIV-1-free survival. • Rate of HIV-1-free survival at 2 years lower in the breastfeeding arm than in the formula feeding arm (58.0% vs 70.0%, respectively; $P = 0.02$).
6. Coutsooudis A, Pillay K, Kuhn L, Spooner E, Tsai WY, Coovadia HM. 2001 ²¹	Method of feeding and transmission of HIV-1 from mothers to children by 15 months of age: prospective cohort study from Durban, South Africa.	<ul style="list-style-type: none"> • Three feeding groups assessed (never breastfed, exclusive breast feeders, mixed breast feeders) • Cumulative probabilities of HIV detection remained similar among never and exclusive breast feeders up to 6 months: 0.194 (95% CI 0.136-0.260) and 0.194 (95% CI 0.125-0.274) Cumulative probabilities of HIV detection among mixed breast feeders reached 0.261 (95% CI 0.205-0.319) by 6 months. • By 15 months, the cumulative probability of HIV infection remained lower among those who exclusively breastfed for 3 months or more than among other breast feeders (0.24 vs 0.35). • Infants exclusively breastfed for 3 months or more had no excess risk of HIV infection over 6 months than those never breastfed.
7. Bahl R, Frost C, Kirkwood BR, Edmond K, Martines J, Bhandari N, Arthur P. 2005 ²²	Infant feeding patterns and risks of death and hospitalization in the first half of infancy: multicentre cohort study	<ul style="list-style-type: none"> • No significant difference in the risk of death between children who were exclusively breastfed and those who were predominantly breastfed (adjusted hazard ratio (HR) = 1.46; 95% CI = 0.75-2.86). • Non-breastfed infants had a higher risk of dying when compared with those who had been predominantly breastfed (HR = 10.5; 95% CI = 5.0-22.0; $P < 0.001$) as did partially breastfed infants (HR = 2.46; 95% CI = 1.44-4.18; $P = 0.001$) • Extremely high risks of infant mortality associated with not being breastfed need to be considered during infant feeding counseling • Risks of death are similar for infants who are predominantly breastfed and those who are exclusively breastfed therefore authors suggest that in settings where rates of predominant breastfeeding are already high, promotion efforts should focus on sustaining these.

Prior to 2008, the National South African PMTCT protocol made provision for the administration of single dose nevirapine (sdNVP) to both mother and baby. Policy guidelines stated that sdNVP was to be issued to all HIV-infected pregnant women after 28 weeks gestation, to be taken at the onset of labor, and sdNVP syrup was to be given to all HIV-exposed babies within 72 hours after birth. In 2008 the revised National PMTCT guidelines²³ were issued, which made provision for two anti-retroviral medications (AZT and NVP) – commonly referred to as ‘dual therapy’ to be issued to both mother and baby. The guidelines stipulated that all HIV-infected pregnant women with CD4 counts > 200 cells/mm³ should receive AZT medication from 28 weeks gestation and sdNVP at the onset of labor and all HIV-exposed infants should receive sdNVP and at least seven days of AZT. In 2009, the South African National Department of Health issued the Accelerated PMTCT plan in an attempt to hasten delivery of high quality PMTCT care throughout the country²⁴, which was followed by revised national PMTCT guidelines in 2010. These guidelines stress the early commencement of HAART for all eligible HIV positive pregnant women (those with CD4 count < 350 cells/mm³ or less or WHO stage 3 or 4, including those co-infected with TB/HIV) and make provision for AZT from 14 weeks, intrapartum AZT and sdNVP and TDF + FTC (single dose) after delivery for those women who are ineligible for life long HAART. The guidelines also make provision for infant NVP for six weeks if infants are not breastfed²⁵, but for twelve months or until earlier cessation of breastfeeding if infants are breastfed.

1.1.2 The evolution of infant feeding counseling

1.1.2.1 Global picture of infant feeding in the context of HIV infection

Promotion of breastfeeding has been ranked as the most cost-effective intervention for child survival, and could prevent 13–15% of child deaths in low-income countries. Recent data published by Patel et al.²⁶ demonstrates better growth parameters for infants who are breastfed, particularly during the first six weeks of life, irrespective of HIV status of the mothers. The authors conclude that optimal early feeding practices ameliorate the effect of being born to an HIV-infected mother and strengthen the recommendation of exclusive breast feeding for HIV-infected women in terms of long term child health. However, in some circumstances, breastfeeding can transmit HIV, which presents a terrible dilemma for parents and policymakers. UNAIDS estimates that over 300 000 children are infected with HIV through breastfeeding every year¹.

With rapid advances in PMTCT programs, exclusive formula feeding has been touted as a safer alternative to provide optimal nutrition for HIV-exposed babies. The World Health Organization (WHO) guidelines²⁷ endorse the provision of replacement feeds when all AFASS (affordable, feasible, acceptable, sustainable and safe) criteria are met.

1.1.2.2 Infant feeding in the context of HIV infection in South Africa

In South Africa, it is believed that the proportion of HIV-infected women who choose to breast feed is high, although several studies^{18,20,21} have reported that exclusive breast feeding is the exception, rather than the rule. Further evidence of mixed feeding is demonstrated by the significantly high HIV transmission rates to babies born to HIV-

infected women, who initially chose to breastfeed but resorted to mixed feeding for various reasons. Coovadia et al.²⁸ report on high HIV transmission rates in infants reported to be exclusively breastfed (14.1% by 6 weeks and 19.5% by 6 months of age) within the South African population. Other studies describe transmission rates in South Africa as between 19 – 36% without intervention and between 10 – 15% with PMTCT interventions. In Sub-Saharan Africa, transmission rates range between 25 – 40% without interventions and between 10 – 20% with PMTCT intervention^{28,29}. South African National Department of Health data³⁰ describes HIV transmission rates as ranging from 9% to over 30% in South Africa, due to significant inter-provincial differences in access to timely care and prevention initiatives for HIV-infected pregnant women.

1.2 Statement of the problem

Infant feeding practices for HIV exposed babies within Soweto have been greatly influenced by the availability and provision of infant feeding counseling since the rollout of PMTCT programs. To date, these programs have provided an excellent service with very high acceptance rates for all interventions. Kali et al describe HIV testing uptake rates of over 90% during routine antenatal care³¹ in Soweto. The availability of large volumes of clinical data relating to PMTCT programs highlight related challenges and successes and illustrate the variation between the effectiveness of different clinical interventions. Although several authors describe the mortality and morbidity in HIV-exposed infants^{32,33,34,35} while others discuss PMTCT programs in resource constrained countries^{36,37,38,39,40,41,42,43}, there is a relative paucity of data relating to the practicalities of

HIV positive mothers towards the different feeding methods available for their babies. Within certain areas in Johannesburg, rates of breastfeeding are lower than in the rest of the country with a larger proportion of HIV-infected women having access to clean water and sanitation and choosing to exclusively formula feed their babies⁴⁴. There is very little data within South Africa describing the practicalities regarding the various infant-feeding options available to HIV positive women. This knowledge is essential if PMTCT programs within South Africa are to succeed, with subsequent reduction of transmission of HIV to exposed babies and related paediatric mortality.

The current study evaluated the infant feeding practices of HIV infected women, who were exposed to the PMTCT program within Soweto, Johannesburg and explored the practices of these women regarding the types of infant feeding available to them and the reasons for their choices. The study also examined potential correlations between the chosen modality of infant feeding and HIV infection of the infants. The HIV status of the infant was ascertained through DNA PCR testing performed at 4 weeks of age.

1.3 Justifications for the study

Although there is a wealth of literature pertaining to the types of infant feeding options (exclusive breast feeding vs exclusive substitute / formula feeding) available to HIV infected women internationally, there is very little literature pertaining to the practicalities of these methods for HIV-infected women in this context.

Current UNAIDS/WHO/UNICEF recommendations stress avoidance of all breast-feeding if replacement feeding fulfils the key requirements of being affordable, feasible, acceptable, sustainable, and safe (AFASS) ⁴⁵. Alternatively, HIV positive women are advised to breastfeed exclusively but to stop as early as possible. The advice to breastfeed exclusively is based on the finding that infants who are exclusively or predominantly breastfed have a lower risk of dying from common childhood infections than those who are partially or completely weaned and that exclusive breastfeeding may carry a lower risk of HIV transmission than partial breastfeeding ^{21,22}. The most important elements of the information given to HIV-infected mothers in order to help them make an informed decision on infant feeding concern the risk of HIV transmission through breastfeeding ^{16,18,20}. However, within the majority of studies, exclusive breastfeeding / formula feeding has been described as the exception rather than the rule. In developing countries, Kuhn et al.⁴⁶ describe patterns of mixed feeding, while Miotti et al.⁴⁷ elaborate on HIV transmission through breastfeeding in Malawi. In their study, Dimond and Ashworth⁴⁸ describe in detail the occurrence of mixed feeding within Kenya, Mexico and Malaysia. The documented patterns of infant feeding by HIV-positive mothers from 2000 to 2004 in Pune, India described by Shankar et al. highlight the complexities of making an informed and healthy choice under sub-optimal conditions ⁴⁹, including lack of disclosure of HIV status, stigma, involvement of extended family in infant feeding decisions, poverty and gender inequalities.

The 2009 WHO guidelines⁴⁵ on HIV and Infant Feeding are based on the following eight key principles: Balancing HIV prevention with protection from other causes of child mortality; Integrating HIV interventions into maternal and child health services; Setting national or sub-national recommendations for infant feeding in the context of HIV; Informing mothers known to be HIV-infected about infant feeding alternatives; Providing services to specifically support mothers to appropriately feed their infants; Avoiding harm to infant feeding practices in the general population; Advising mothers who are HIV uninfected or whose HIV status is unknown; and Investing in improvements in infant feeding practices in the context of HIV.

Within this context, key WHO recommendations include:

1. *Ensuring mothers receive the care they need* - mothers known to be HIV-infected should be provided with lifelong antiretroviral therapy or antiretroviral prophylaxis interventions to reduce HIV transmission through breastfeeding according to WHO recommendations.
2. *Which breastfeeding practices and for how long* - mothers known to be HIV-infected (and whose infants are HIV uninfected or of unknown HIV status) should exclusively breastfeed their infants for the first 6 months of life, introducing appropriate complementary foods thereafter, and continue breast-feeding for the first 12 months of life. Breastfeeding should then only stop once a nutritionally adequate and safe diet without breast milk can be provided.

3. *When mothers decide to stop breastfeeding* - mothers known to be HIV-infected who decide to stop breastfeeding at any time should stop gradually within one month. Mothers or infants who have been receiving ARV prophylaxis should continue prophylaxis for one week after breastfeeding is fully stopped. Stopping breastfeeding abruptly is not advised.
4. *What to feed infants when mothers stop breastfeeding* - when mothers known to be HIV-infected decide to stop breastfeeding at any time, infants should be provided with safe and adequate replacement feeds to enable normal growth and development.
5. *Conditions needed to safely formula feed* - mothers known to be HIV-infected should only give commercial infant formula milk as a replacement feed to their HIV uninfected infants or infants who are of unknown HIV status, when AFASS criteria are met: (as referred to in the 2006 WHO recommendations on HIV and Infant Feeding).
6. *Heat-treated, expressed breast milk* - mothers known to be HIV-infected may consider expressing and heat-treating breast milk as an interim feeding strategy.
7. *When the infant is HIV-infected* - if infants and young children are known to be HIV-infected, mothers are strongly encouraged to exclusively breastfeed for the first 6 months of life and continue breast-feeding as per the recommendations for the general population, that is up to two years or beyond.

1.4 Study objectives

1.4.1 Main study objective

The main study objective was to evaluate the infant feeding practices of HIV infected women, who were exposed to the PMTCT program within Soweto, Johannesburg. The study intended to explore the practices of these women regarding the types of infant feeding available to them (exclusive breastfeeding / exclusive formula feeding / mixed feeding) and the reasons for their choices during the period 01 April 2007 to 30 June 2007.

1.4.2 Specific study objectives

The specific study objectives were:

1. To describe the perceptions of HIV positive mothers in Soweto within the first 6 months post partum with respect to infant feeding practices i.e. exclusive breastfeeding or formula feeding.
2. To determine the proportion of women who, prior to delivery and discovery of their baby's status, intended to exclusively formula / breast feed, but who in fact practiced mixed feeding.
3. To determine the proportion of women who practice exclusive breast feeding, exclusive formula feeding or mixed feeding and the reasons for this.
4. To explore potential relationships between HIV status of the infant and infant feeding choices, within this population.

CHAPTER 2: STUDY METHODS

2.1 Study design

A cross-sectional study was conducted. The study has both descriptive and analytic components, which were based on quantitative data collected from study participants.

2.2 Description of the study site

Within Soweto, the PMTCT program is offered at the PHRU clinic located in Chris Hani Baragwanath Hospital and all primary health care clinics where PMTCT trained nursing staff are available, usually in facilities where antenatal services are offered. Women are seen throughout the duration of their pregnancies, at monthly intervals, with Counseling and Testing (CT) for HIV, nutritional support, infant feeding counseling and wellness education being offered during these visits, among other interventions. After delivery, HIV infected women are asked to bring their babies for HIV testing at four weeks to the clinics and for receipt of the HIV test results and immunization at six weeks of age. At the six week visit, following on receipt of the HIV test results, women attending the PHRU clinic in Soweto were approached for participation on the study. The median time between delivery and infant HIV test was 4.2 weeks and the median time between delivery and interview was 6.6 weeks.

2.3 Study population

The study participants were all HIV-positive women recruited from the PMTCT program at the PHRU at Chris Hani Baragwanath hospital.

Study sample

As there were no previous studies on which to calculate the sample size, within this population, estimates were necessary. Based on unpublished experience from PMTCT clinical trial participants within this population, it was estimated that at least 85% of all HIV infected women within Soweto intend to exclusively formula feed, while 15% intend to exclusively breastfeed. Of these women, it was estimated that between 5 – 10% would practice mixed feeding for various reasons. In order for the study to achieve 90% power in a population with an HIV prevalence rate of 29.2%, at a 95% confidence interval (CI), a sample of 200 women was deemed an adequate sample for this study.

2.4 Inclusion criteria/Study sample

The inclusion criteria were as follows:

- Attending PMTCT clinics
- HIV positive woman
- Fluency in at least one official South African language
- Voluntary participation
- HIV status of infant known to mother
- Live infants

2.5 Exclusion criteria

The exclusion criteria included:

- Unwilling / refusal to participate
- Unknown HIV status (mother/baby)
- Hospitalized infant
- Any birth related trauma / complications that would preclude participation in study

2.6 Data collection and measurement

The study period was from the 1st of April 2007 to the 30th of June 2007. Data was collected by means of an interview, using a semi-structured questionnaire, from HIV infected women enrolled in the PMTCT program at the Perinatal HIV Research Unit in Soweto. Data was also obtained from study participant's maternity cards and PMTCT records. The semi-structured questionnaire comprised multiple choice questions as well as open-ended questions, which was important to gauge the feelings of participants enrolled in this study. The questionnaire was developed by means of field testing among 100 HIV-positive women attending the PMTCT program at PHRU clinics at Chris Hani Baragwanath hospital. It comprised questions pertaining to maternal demographics, information about mode of delivery of the current pregnancy, use of single dose Nevirapine (as recommended by PMTCT guidelines in effect at the time), HIV status of baby, receipt of infant feeding counseling during the antenatal or peripartum period, choice of infant feeding method before and after infant's HIV status was known, reasons

for choice of infant feeding method and preferred method of infant feeding if mother was HIV negative. The questionnaire was also designed to provide for confidentiality by only registering the initials of the mother and the baby, and providing each participant with a unique subject number. Prior to conducting the interviews, all study participants were informed about the study verbally and provided with an information sheet with relevant contact names and numbers. They were also informed that the study had received ethical (HREC) approval. All participants signed a consent form.

Interviews were conducted by two trained female staff members within the PMTCT clinic at PHRU, who were fluent in local languages. All the interviews were conducted in a private counseling room where participants had adequate privacy. All the participants were given the opportunity to communicate in their local language, although this was not necessary. The interviews were all conducted in English, with no need for translation required. The average duration of the interviews was 15 minutes. Participants entered the study voluntarily and were not paid for participation. The interviewers' salaries were paid by the relevant employer. All photocopying of questionnaires and stationary costs were borne by the investigator.

A study recruitment logbook of the subject numbers and full names of mother and baby was maintained for all registered participants, in order to verify data (such as date of delivery, maternal age, etc) where necessary. Additional information (such as mode of

delivery, maternal and baby NVP uptake) was verified or obtained from maternity cards and PMTCT records. Logbook access was strictly controlled in order to protect the participants and ensure confidentiality. All completed questionnaires were filed and stored in a locked cupboard with restricted access. The information form, consent form and questionnaire used in the study are attached as Appendix 1.

2.7 Data analysis

Data capture was done by the investigator by single entry into Microsoft Excel version 2000 where it was cleaned and exported into STATA (intercooled STATA general purpose statistical software, version 9, updated 2007) to analyze the data. Variables were categorized as numerical and categorical. Measures of central tendency (mean, median, and mode) and measures of dispersion (variance and standard deviation) were determined for numerical variables. Statistical applications using uni-variate and multi-variate analysis such as Pearson's Chi-Square test, Yates corrected Chi-Square test, and Fisher exact test were used to compare means and proportions.

2.8 Ethical considerations

The University of Witwatersrand Committee for Research on Human Subjects (Medical) approved this study to be conducted at the Perinatal HIV Research Unit in Soweto (Ref: Jacobs-Jokhan: protocol number M070335). All information concerning study participants and their personal data were kept anonymous and confidential. Names, addresses and hospital numbers were not part of the research data. Therefore, the data

does not contain any information that identifies any of the women or their babies in this study.

2.9 Potential study limitations

Potential limitations of the study include the fact that since the study was a cross sectional study conducted at a research unit in Gauteng province, the study participants recruited may not be representative of all HIV positive women in South Africa.

Another potential limitation was participants within the study may have had recall bias as this study was conducted in women who had delivered at least six weeks prior. A third limitation may be that the interview instrument which was utilized for measurement was not piloted among the study participants prior to use and may therefore have overlooked important issues. An additional limitation includes the fact that there was selection bias, as all of the 200 study participants were selected only from the site at which the research study was conducted. There may also have been social desirability bias, as study participants may have provided incorrect or inaccurate answers in order to satisfy the interviewers.

Potential confounders relate to information pertaining to maternal CD4 and HIV viral load was not collected, as these were beyond the scope of the study. The impact of low maternal CD4 counts (<350) and high HIV viral loads (>5000 copies) on increasing MTCT has been well documented by several authors^{30,32,38,39,41,42}, irrespective of infant feeding method practiced.

CHAPTER 3: STUDY RESULTS

3.1 Description of the study population

3.1.1. Demographic characteristics of the study population

The demographic characteristics of the study population are described in Table 2 below.

Table 2: Demographic characteristics of the study population

Demographic characteristics	Total number (n)	Percentage (%)
Age of participants		
15 – 19	9	4.5
20 – 24	52	26
25 – 29	66	33
30 - 34	45	22.5
> 35	28	14
Marital Status		
Divorced	1	0.5
Married	23	11.5
Engaged / living with partner	61	30.5
Single	115	57.5
Gender of baby		
Boys	106	53
Girls	94	47

Demographic characteristics	Total number (n)	Percentage (%)
Number of other children		
0	61	30.5
1	54	27
2	64	32
3	18	9
4	3	1.5
Mode of Delivery		
Normal Vaginal Delivery	144	72
Caesarean Section	53	26.5
Instrumental	3	1.5

3.1.1 Age of participants

A total of 200 HIV positive women were interviewed at the Perinatal HIV Research Unit in Chris Hani Baragwanath Hospital, Soweto, between 01 April 2007 and 30 June 2007. The mean age of the participants was 30 years, the median age was 27 years and the inter-quartile range was 17 – 45 years. The fewest number of participants (4.5%) were between 15 – 19 years, with 26% of participants between 20 – 24 years, 33% of participants between 25 – 29 years, 22.5% of participants between 30 – 34 years and 14% of participants over 35 years of age respectively. This compares favorably with other antenatal HIV prevalence data, as it shows similar distribution.

3.1.2 Marital Status

Regarding the self-reported marital status of the participants, more than a quarter of all the study participants were engaged or living with their partner. This parameter was

important as it had important implications for social and financial support for the study participants.

3.1.3 Number of other children

The study participants indicated that for 61 women (30.5%), this was their first child. The mean number of other children was 1.24, with the mode being 2 children. Nearly a third of the study participants had two other children. This parameter was an important gauge as to whether the study participant's intention to feed was influenced by previous practice or other social / cultural / family traditions and norms.

3.1.4 Mode of delivery

The most common mode of delivery of this baby among the study participants was Normal Vaginal Delivery (NVD). One hundred and forty-four women (72%) delivered by NVD.

3.1.5 Gender of baby

Respondents revealed that out of a total of 200 babies, there were slightly more boys (53%) than girls (47%).

3.1.6 Nevirapine uptake by mother and / baby

Of the 200 respondents, 185 (92.5%) indicated that both mother and baby had received NVP. There were 15 women (7.5 %) however, who indicated that neither mother nor baby had received NVP. All responses regarding NVP uptake were verified from maternity records and PMTCT records. Further analysis of NVP uptake by maternal age is shown in Figure 1 below.

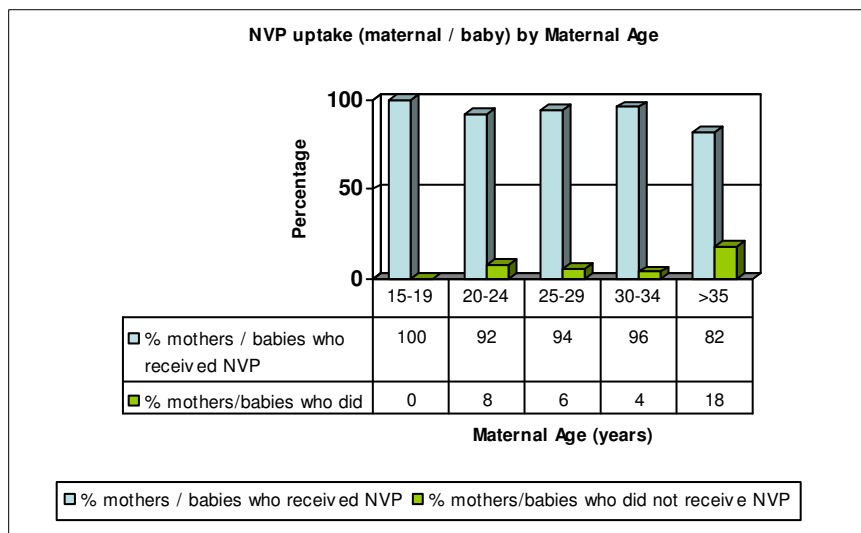


Figure 1: Nevirapine uptake (maternal / baby) by Maternal Age

3.1.7 HIV status of baby

All of the 200 study participants (100%) indicated that they knew their baby's HIV status. Of these, 132 women (66%) said that their babies were HIV negative and 68 women (34%) said that their babies were HIV-infected. Younger women appeared to have a slightly higher proportion of HIV infected babies than older women. This was particularly evident in women between 20 – 24 years of age where 38% of babies were HIV infected, although there was no statistical significance (p value = 0.83).

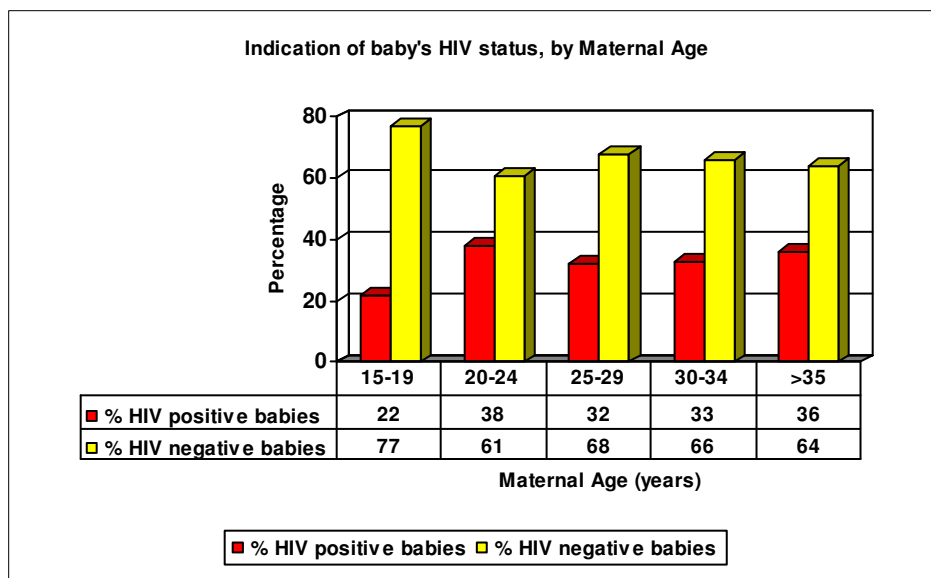


Figure 2: Baby's HIV status by Maternal Age

3.1.8 The number of women receiving information on infant feeding options

One hundred and sixty-nine women (84.5%) received information on infant feeding options, while 31 (15.5%) said they had never received any information on infant feeding options. Comparative analysis of the HIV status of the baby and receipt of information on feeding options by mothers showed a statistically significant difference ($p=0.003$) between women who had received information on infant feeding options, (where 28.1% of babies were HIV-infected) as compared to those who had never received any information on infant feeding options or who received this information 6 weeks or more after delivery (where 57.5% of babies were HIV-infected).

Of those women who had received information on infant feeding options, 9 women indicated that they had received this information before their pregnancy, 143 women indicated that they had received this information during their pregnancy, 8 women indicated that they had received this information immediately after delivery, 5 women

indicated that they had received this information 6 weeks after their pregnancy and 4 women indicated that they had received this information more than 6 weeks after their pregnancy. Analysis of this data revealed no statistical significance ($p=0.104$) between the preferred method of infant feeding and the period during which information was received. However, comparison of the baby's HIV status with timing of receipt of information on infant feeding choices was statistically significant ($p<0.001$), with a higher rate of reported infant HIV infection (100%) among 9 babies whose mothers received information on infant feeding options 6 weeks or more after delivery. It is important to note, however, that as infants were only tested at 4-6 weeks, peri-natal HIV transmission may also have occurred in-utero or intrapartum.

Table 3: Number of women receiving information on infant feeding options compared with number of HIV infections in their babies

Information on infant feeding options (Mothers)			HIV Infections (Babies)	
	Number (N)	Percent (%)	Number (N)	Percent (%)
Never	31	15%	14	45%
Before Pregnancy	9	5%	2	22%
During Pregnancy	143	71%	39	27%
Immediately after delivery	8	4%	4	50%
6 weeks after delivery	5	3%	5	100%
More than 6 weeks after	4	2%	4	100%
TOTAL	200	100%	68	100%

3.1.9 Proportion of women receiving infant feeding information by age

Of the 169 women who reported receiving information about infant feeding options further analysis revealed that 88.8% of all mothers 15 - 19 years, 80.7% of women 20 – 24 years, 87.8% of women 24 - 29 years, 82.2% of women aged 30 – 34 years and 85.7% of women above 35 years had received information on infant feeding options. Although not statistically significant, this does not correlate well with the NVP uptake figures, which are much higher in all age categories, indicating a significant gap in antenatal care (p value for trend = 0.85).

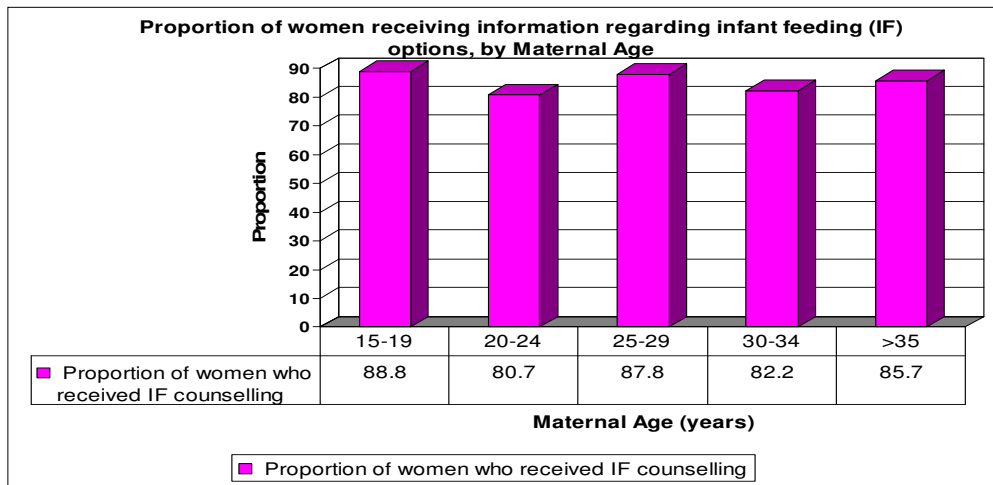


Figure 3: Proportion of women receiving information regarding infant feeding options, by Maternal age

3.1.10 Mother's infant feeding choice prior to knowledge of baby's HIV status

Of the 200 study participants, 169 (84.5%) indicated that they had exclusively formula fed before they found out the baby's HIV status, while 28 (14%) revealed that they had exclusively breast fed and 3 (1.5%) indicated that they had given both breast and formula milk to their babies.

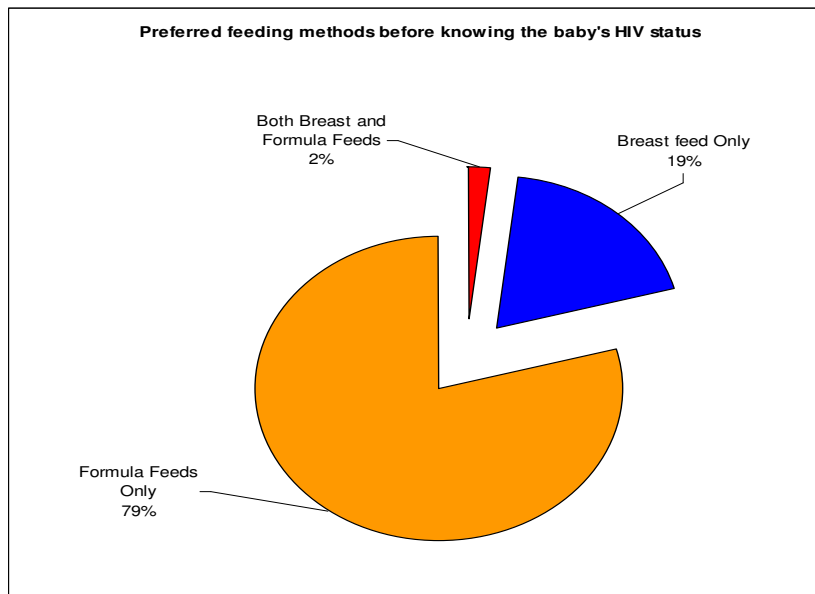


Figure 4: Preferred infant feeding methods prior to knowledge of Baby's HIV status

Analysis indicated a statistically significant difference between the maternal age and the mother's infant feeding intention prior to discovery of the baby's HIV status ($p < 0.001$). More than half of the women (>50%) in all age groupings intended to exclusively formula feed their babies prior to discovery of the baby's HIV status (55.5 % of all mothers 15 - 19 years, 86.5% of women 20 – 24 years, 80.3% of women 24 - 29 years, 84.4% of women aged 30 – 34 years and 64.3%% of women above 35 years). This pattern peaked (86.5%) among women aged 20-24 years old.

The majority of women (84.5%, n = 169) intended to exclusively formula feed, prior to discovery of their baby's status. Among these women, the majority of them (49%, n = 83) indicated that they were afraid of infecting their babies with the HIV virus, while 28% indicated that exclusive formula feeding was safe and better for the baby (28%, n = 48), as the main reasons for their choice.

Other reasons cited for the choice of exclusive formula feeding included the fact that the formula milk was freely available and accessible (2%, n= 3), and formula feeding was a convenient choice, as many women were working mothers (7%, n = 12). Three women cited medical problems while 2 others said they believed that formula feeds were nutritious and healthy and ensured that their babies would be full. Sixteen women said they chose to exclusively formula feed as they were advised by their health care providers to choose this method, while 4 women indicated that they wanted to avoid weaning difficulties. There was one woman who gave no reason for her choice.

Logistic regression analysis revealed that the feeding method preferred by the mother has a significant relationship with feeding method practiced by the mother prior to discovery of the baby's HIV status. This was especially pertinent in the case of women intending to exclusively formula feed – i.e. those mothers who intended to exclusively formula feed prior to the discovery of their baby's HIV status, were 32.6 times more likely to practice it (formula feed) as compared to those intending to practice exclusive breastfeeding (p value > 0.001) [95% CI 25.9 – 39.2].

3.1.11 Mother's infant feeding choice after found out baby's HIV status

Further questioning of the study participants regarding the mother's infant feeding choice after she found out baby's HIV status revealed 192 (96 %) indicated that they exclusively formula fed their babies, while only 8 (4 %) revealed that they exclusively breast fed their babies. There were no women who indicated that they had given both breast and formula milk to their babies.

3.1.12 Mother's infant feeding choice if she was HIV uninfected (negative)

When questioned about the mode of feeding the study participants would have chosen, if they were HIV uninfected, the overwhelming majority, 156 women (78%) indicated that they would prefer exclusive breast feeding, as the majority of these women believed that breast milk was best for babies and would help babies grow strong and healthy. Other reasons cited included the fact that breast milk was readily available and would allow mothers to bond with their babies. Eighteen women (9%) indicated that they would prefer exclusive formula feeding as all of these women were working and wanted to ensure that someone else could feed the baby while they were away. Twenty six women (13%) indicated that they would prefer both breast and formula feeding, in order for their babies to benefit from both types of feeding.

Comparative analysis of the participants' responses, by maternal age, revealed that none of the women aged 15 - 19 years, said they would give both breast and formula feeds, while 7 (77.7%) said they would give breast feeds only and 2 (22.2%) said they would give formula feeds only. In the age group 20 – 24 years, 8 (14.8%) women said they would give both breast and formula feeds, while 39 (72.2%) said they would give breast

feeds only and 5 (9.2%) said they would give formula feeds only. In the age group 25 - 29 years, 9 (13.6%) said they would give both breast and formula feeds, while 52 (78.7%) said they would give breast feeds only and 5 (7.5%) said they would give formula feeds only. In the age group 30 – 34 years, 7 (15.5%) said they would give both breast and formula feeds, while 34 (75.5%) said they would give breast feeds only and 4 (8.8%) said they would give formula feeds only. Among women above 35 years, 2 (7.1%) said they would give both breast and formula feeds, while 24 (85.7%) said they would give breast feeds only and 2 (7.1%) said they would give formula feeds only.

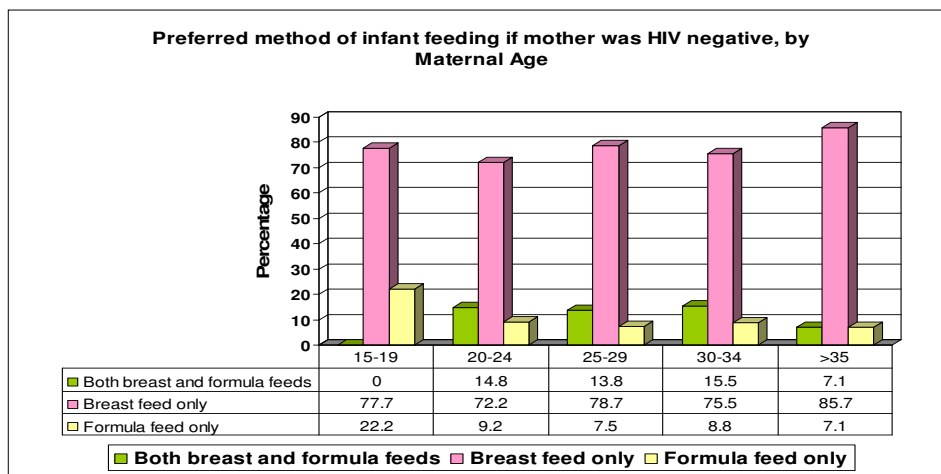


Figure 5: Preferred Infant feeding method if mother was HIV-negative, by Maternal Age

CHAPTER 4: DISCUSSION

This study suggests several important findings:

Firstly, the study suggests an association between the HIV status of the baby and the receipt of information on infant feeding methods by the mother (p value <0.0001). However, it is important to highlight the small sample size and the multi-factorial causes of HIV within this context. The study further illustrates that the time period within which infant feeding counseling is provided to an HIV-infected mother is critically important and suggests that all information should be provided to women prior to the 6 week postnatal visit. These findings have important implications for PMTCT programs as they point to the need to actively follow up all HIV-infected women during their pregnancies and ensure that they have all received, and understood, information pertaining to infant feeding choices prior to or immediately after delivery. This is further reinforced by work by Chopra et al⁵⁴ which revealed that provision of infant feeding counseling to PMTCT clients in South Africa was often inconsistent, with poor maternal knowledge of best available infant feeding option. The authors highlighted poor quality of infant feeding counseling coupled with minimal specific advice and support to promote adherence to the chosen method once a decision was made. Consistent with work done elsewhere^{68,69}, poor counseling and lack of subsequent support for the infant feeding decision almost inevitably leads to mixed feeding, which has been shown to increase the risk of MTCT⁷⁰.

Secondly, the study highlighted the discrepancy between higher NVP uptake rates as compared with lower rates of infant feeding counseling receipt by study participants. There were proportionally lower numbers of women, in all age categories, who reported receiving information on infant feeding options, when compared with the NVP uptake

figures. This may indicate several issues, firstly since the majority of antenatal care, including infant feeding counseling, is provided at PHC clinic level while maternity deliveries, including issuing of NVP are conducted at a higher level of care such as CHC / MOU / hospital level, it may indicate better care provision at the higher level facility setting; secondly, it may point to inadequately trained / skilled staff at PHC clinic level, leading to poor compliance with national guidelines among health care workers in PMTCT programs and; thirdly it may indicate that several women may have only had their HIV test shortly before delivery. This indicates a vital gap in antenatal care and speaks to the need for a greater emphasis on counseling and information dissemination. Fifteen percent of all the study participants indicated that they had never received any infant feeding counseling, despite the numerous occasions when this information could have been provided. This is an alarming statistic which raises concerns regarding the issues of continuum of care and provision of holistic care to these women. For PMTCT programs to be successful, all pregnant women must receive counseling and testing for HIV at least twice during their pregnancies in order to avoid missing women who are HIV-infected or who sero-convert late in their pregnancies.

Thirdly, the study shows that the majority of women would prefer to breastfeed their babies, if they were HIV negative, highlighting the importance of knowing one's status. This study clearly illustrates the high transmission rate of HIV in babies who receive mixed feeding as well as among those babies who receive breast feeding. While there are several proponents of exclusive breastfeeding among HIV positive women in the African situation^{21,22}, the indisputable fact remains that breastfeeding is one amongst the myriad factors influencing mother-to-child transmission of HIV.

According to a recent Chinese study, Liang et al⁵⁵ reported very high mother-to child transmission rates of 36% in women who were infected with HIV through blood transfusions during labor or after delivery and who had practiced breast feeding. The Chinese study highlighted the importance of identifying new peripartum maternal HIV infections and the high rates of transmission in mothers with high HIV viral loads, who breastfed their babies. In order to counter this risk, the new South African PMTCT policy, makes provision for extended NVP provision (up to 6 weeks) for all HIV-exposed babies, while asserting that babies should remain on NVP for as long as breastfeeding continues²⁵.

Fourthly, the study also showed a very high overall HIV transmission rate of 34%, while other studies done around the same time by Colvin et al (2002 – 2004) in the Soweto population described HIV transmission rates of between 8.6% - 13.7%. Martinson et al⁴⁴ also described MTCT rates in consecutive pregnancies of women exposed to single-dose nevirapine in Soweto, in 2007 as being 11.1%. This would no doubt raise valid questions on the generalizability of the study to the South African population. However, the study population appears to be representative of the situation in Soweto, as the women varied in age, marital status, socioeconomic status and number of other children, similar to other studies. A study published by Morris et al in the late 1990s described that in Soweto about a quarter of all households were headed by single women. The fact that females were the breadwinners, in about a third of all households, indicated that in many households women were not only primarily responsible for child-rearing and domestic chores but were also responsible for ensuring that the household had financial resources¹². Other studies published a decade later by Gray et al⁴², Martinson et al⁴⁴ and

Lazarus et al⁵⁰ and in Soweto describe the median age of study participants as 26 years, with a median of 2.5 other children, while Agarwal⁵² describes the fact that over 20% women in South Africa are single parents and Smith⁵³ discusses the implications of single parenthood on the development of children and adolescents in South Africa.

The main objectives of this study were achieved, with important findings being described regarding the infant feeding practices of HIV-positive women on PMTCT programs in Soweto and some of the reasons for their choices. Associations between HIV-status of the baby and the infant feeding modality have also been described, which has significant implications for PMTCT programs. However, potential confounders, including the fact that information pertaining to the maternal CD4 count and HIV viral load was beyond the scope of the study and the fact that the sample may have included women with more advanced HIV disease may skew the results somewhat. The very high HIV transmission rate in this study raises questions regarding the reported rate of mixed feeding as compared to the actual mixed feeding rate. Additionally, the study had some limitations including a small sample size, selection bias, recall bias and social desirability bias which may impact on the results as well.

CHAPTER 5: CONCLUSIONS

Within PMTCT programs, post-natal factors including breast-milk transmission account for up to 30% of all cases. The issue of infant feeding in the context of HIV has become an increasingly important public health issue.

Since this study was conducted, a wealth of literature has been produced, illustrating the key role of infant feeding counseling in reducing transmission rates.

Despite findings from clinical research documenting higher HIV transmission rates in women who practice mixed feeding, it appears that this trend is on the rise. This increase or increased risk could be attributed the fact that contributory factors such as poverty, lack of awareness, poor quality infant feeding counseling, lack of disclosure and stigma have not been addressed or managed. As a result, HIV and AIDS-related illnesses continue to be one of the key burdens of disease in South Africa.

In spite of a relatively small sample size, this study established that within the study population, there was a generally high uptake of nevirapine and infant feeding counseling, with the majority of women receiving this information during their pregnancies. However, there was also a large percentage of women who had never received any infant feeding counseling, despite the numerous occasions when this information may have been provided, pointing to significant quality gaps in the continuity of care. Despite reportedly high exclusive formula feeding (84.5%) and exclusive breastfeeding (14%) rates as compared to lower mixed feeding (1.5%) rates in this population, the corresponding HIV transmission rate of 34% among the babies was extremely high.

The study also demonstrated the vital role of infant feeding counseling in antenatal care and PMTCT programs with statistically significant correlations ($p < 0.001$) between maternal receipt of infant feeding counseling, timing of this counseling and HIV status of the baby. It illustrated that it was critically important that all HIV-infected women receive

infant feeding counseling as soon as possible after the HIV diagnosis is made, prior to delivery and highlighted the importance of reinforcement of infant feeding choice at every antenatal care visit, for every woman.

This study also examined the infant feeding modality women would choose if they were HIV negative, in order to gauge the impact the HIV epidemic has had on infant feeding modalities. The overwhelming majority of the respondents (78%) indicated that they would prefer exclusive breast feeding if they were HIV uninfected. This illustrates the significant impact HIV has on choice of infant feeding modality, demonstrating once again the importance for all pregnant women to be aware of their HIV status, prior to labor and delivery.

CHAPTER 6: RECOMMENDATIONS

Important recommendations emanating from this study include the following:

6.1 Improved Antenatal care for all pregnant women

All pregnant women should be encouraged to book early into antenatal care to receive routine antenatal care, including information on the availability of PMTCT interventions and access to HIV counseling and testing. They should also be provided with counseling on safe infant feeding options and assisted in making an appropriate feeding choice. Emphasis should also be placed on re-testing of HIV-negative women at 32 weeks, in line with national PMTCT guidelines.

6.2 Improved care for HIV-positive pregnant women

In addition to routine ANC care all HIV-positive pregnant women should be clinically and immunologically staged at the earliest opportunity. Focus should be placed on women between the ages of 24 – 29 years. They should also be screened and treated for TB and other opportunistic infections, in line with the Basic Antenatal Care Package (BANC). Where indicated, all women should be fast-tracked to receive either lifelong HAART (CD4 count <350cells/mm) or the PMTCT regimen.

6.3 Improvements in infant feeding counseling for HIV positive women

Specific emphasis should be placed on infant feeding counseling for HIV-infected pregnant women. All women should be provided with information regarding different infant feeding modalities. All advice provided should be specific within the context of each woman's life. Infant feeding should be discussed with women at every antenatal visit. In women who choose to exclusively formula feed, all AFASS criteria should be fulfilled. It is essential that all HIV-positive women are actively followed up prior to and throughout their pregnancies and ensure that they have all received, and understood, information pertaining to infant feeding choices.

6.4 Integration of Maternal and child health programs and PMTCT programs

PMTCT and MCWH programs should be aligned at health facility and sub-district level in order to allow for seamless referral and follow up of HIV-infected women and their children. The concept of shared confidentiality is essential for maintaining continuity of care among women and infants and should be practiced between health care personnel at all levels of the health service. Trained health care personnel should provide high quality,

unambiguous, and unbiased information to all pregnant women about risks of HIV transmission through breastfeeding, ART prophylaxis to reduce this risk, and risks of replacement feeding.

6.5 Intensify ongoing prevention efforts

In order to improve prevention efforts, specific measures should be taken to target high risk population groups, such as school-going children, adolescents / youth and pregnant women with unknown HIV status.

6.6 Further Research

- ❖ It would be important to expand the current research study to include a larger sample size and conduct it within different provinces throughout the country to identify some of the reasons HIV positive women choose certain infant feeding modalities, the context of these choices and associated challenges. This has important implications for policy makers, health workers and researchers. In order to improve the accuracy of reported associations of infant HIV status, the scope of the current study should also be expanded, enabling researchers to access information related to maternal CD4 counts and HIV viral loads.

- ❖ It would also be important to critically evaluate the training that health care workers and counselors receive, regarding infant feeding counseling, including minimum requirements, training curriculum utilized, length / duration of training and certification / accreditation.

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APPENDICES

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Appendix 1: Subject Information form

Appendix 2: Consent form

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Appendix 1: Subject Information Form Infant Feeding Study

Information sheet

Good Day,

I am Dr Jacobs / _____ from the School of Public health, University of the Witwatersrand, and I am investigating the way in which women, such as yourself, feed their babies and whether this has any effect on the HIV status of the babies. This is in order to help medical personnel to improve the quality of care they provide. I would be most grateful if you would consider participating in this work.

Why are we doing this? HIV and AIDS is a growing problem in South Africa. Research has shown that many babies are infected with HIV through mixed feeding practices, despite the fact that women are counseled on infant feeding choices during their pregnancies. I would like to explore the types of feeding practiced by HIV positive mothers with regards to their babies, and why they choose a particular type of feeding.

What do we expect from the participants in the study? Participating in the study involves a single interview at this visit. The interview will take about 20 minutes of your time, and will be conducted in a private room. I will ask you different questions based upon a questionnaire. This information will be kept confidential. The information I collect will not contain any identifying details (only coded study numbers will be used). Your and your child's information will at no stage be made public in a way that can identify you or your child.

Are there benefits to the participants? No, however, this study will help medical professionals and policy makers understand your feelings about feeding your baby and the choices you have made. In addition, the results of the study will be used at medical meetings or in medical journals where the identities of those who participated in the study will not be disclosed.

May I withdraw from the study? Certainly, you may do this at any time without having to give a reason. Remember that the study is completely voluntary and not taking part in it, or withdrawing from it, carries no penalty of any sort.

What about confidentiality? Confidentiality will be maintained by the use of a code instead of names on all results. Only the researcher will have a list of names and codes to enable the code to be linked to a particular woman. This list will be kept locked in an office cupboard.

If you would like to know more about this activity, please ask Dr Donna Jacobs (telephone: 012 - 3421419) who will be happy to answer your questions.

This process was approved by the Ethics Committee of the University of the Witwatersrand in the month of March 2007 [Protocol number M070335].

If you would like to have more information regarding the ethical considerations of the study, you are welcome to call the Chairperson of this committee at the following number

Professor P. Cleaton Jones
Committee for Research on Human Subjects, University of the Witwatersrand.
Tel: 011 717 2229

If you are happy to take part in the study, please read and sign the attached consent form.

Thank you

Dr. D Jacobs

Appendix 2: Subject Consent Form
Infant Feeding Study

I understand what this study is about and have had all my questions about this study answered. I understand that taking part in this study is my choice and that if I decide not to, it will not cause any problems with the treatment that my baby or I will receive at this hospital / clinic.

I may decide to stop taking part in the study at any time and my withdrawal from the study will in no way compromise the care my child receives from the clinic.

I have been given a copy of the Information sheet and the consent form, which I have read, or its contents explained to me in a language that I understand.

Mother's signature:

Mother's name:

Date:

Witness signature:

Witness name:

Date:

NAME AND SIGNATURE OF PERSON WHO OBTAINED INFORMED CONSENT:

..... Date:

Appendix 3: Questionnaire for HIV infant-feeding study

Subject no. _____

(Please circle relevant answers)

Initials of mother _____

Initials of baby _____

Age of mother (yrs) _____

Baby's date of birth ____/____/____

1. Marital status of mother
 - a) single
 - b) married
 - c) divorced / separated
 - d) widowed
 - e) engaged / living with partner
2. Schooling (years) _____
3. No. of other children _____
4. Mode of delivery of this baby
 - a) NVD
 - b) C/S
 - c) Instrumental
5. Sex of baby: Male / Female
6. Did you or your baby receive Nevirapine at any time during or after delivery?
 - a) Yes
 - b) No
7. Do you know your baby's HIV status? (if yes, note status, if no, proceed to next question)
 - a) Yes
 - b) No
8. If yes to Q7, what is status of baby _____
9. If no to Q7, what do you think your baby's HIV status is?
 - a) Infected (Positive)
 - b) Uninfected (Negative)
 - c) I'm not sure
10. Did you receive information about feeding options at any time? a) Yes b) No
11. When did you receive this information?
 - a) Before my pregnancy
 - b) During my pregnancy
 - c) Immediately after delivery
 - d) 6 weeks after delivery (at the post natal clinic)
 - e) More than 6 weeks after delivery
 - f) Never

12. Before you found out your baby's HIV status, how did you intend to feed your baby?

- a) Breast feed only
- b) Formula feeds only
- c) Both breast and formula feeds
- d) Other...(specify please)

13. After you found out your baby's HIV status, how did you feed your baby?

- a) Breast feed only
- b) Formula feeds only
- c) Both breast and formula feeds
- d) Other...(specify please)

14. What method of feeding do you prefer (and why)?

- a) Breast feed only
- b) Formula feeds only
- c) Both breast and formula feeds
- d) Other...(specify please)

15. Reasons for preferred feeding method:

16. What method of feeding would you prefer if you were HIV negative?

- b) Breast feed only
- b) Formula feeds only
- d) Both breast and formula feeds
- d) Other...(specify please)

17. What are your reasons?

Thank you for your answers.